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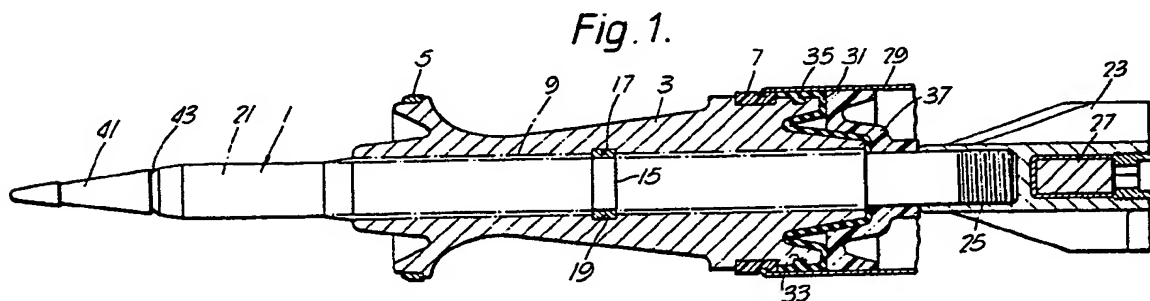
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GB 2128301 A **US 4476785 A** **US 4469027 A**
US 4467724 A **US 4424748 A**

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(54) **Sabot projectile**

(57) A projectile for an APFSDS round comprises a penetrator rod 1 and a sabot 3, the penetrator rod having at its front end a nose, at its rear end a formation for attachment of a fin tail and on its surface along a substantial portion of its length at least two screw thread portions between which is an unthreaded region, the sabot being securable on the penetrator rod by screw thread portions complementary to those on the penetrator rod, the sabot having an unthreaded region between its screw thread portions, and a collar 19 separating one of the said screw thread portions of the penetrator rod and the sabot thereby providing a lock to resist movement of the penetrator screw thread portions relative to the sabot screw thread portions.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig. 1.

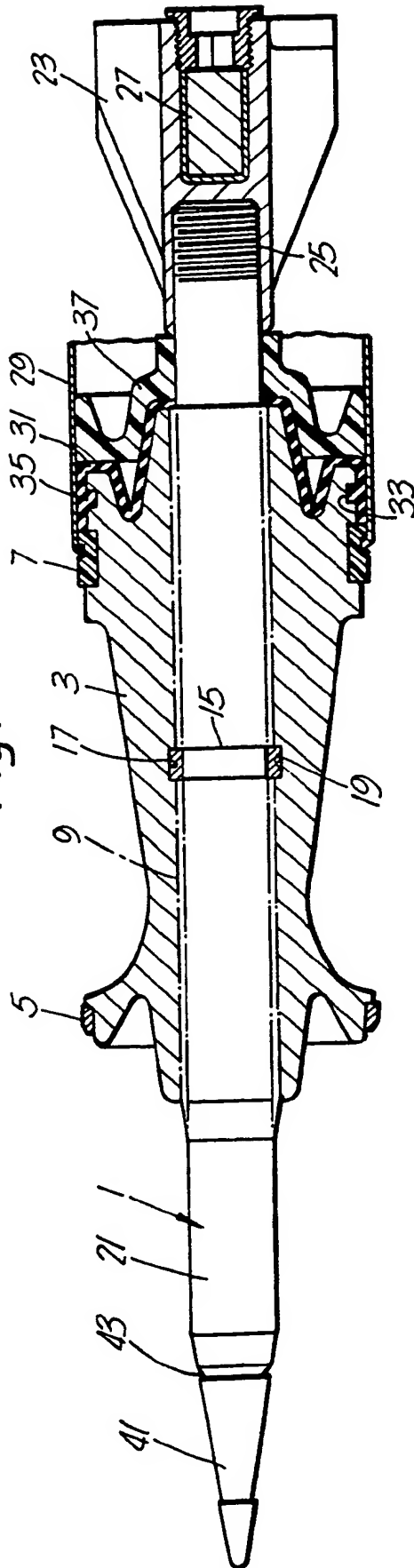
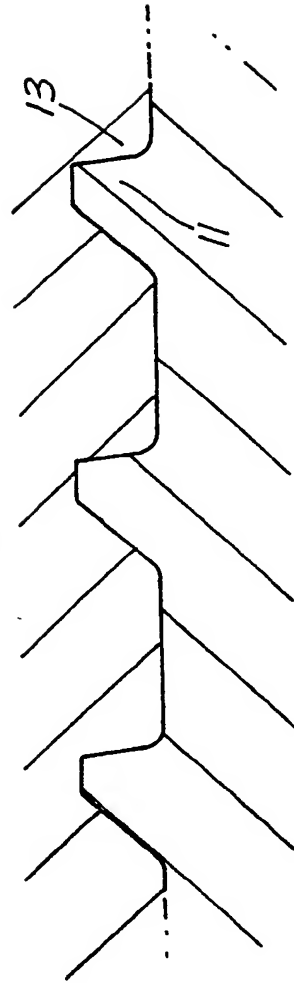


Fig. 2.



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PROJECTILES AND COMPONENTS THEREFOR

The present invention relates to projectiles and components therefor particularly for armour piercing fin stabilised discarding sabot (APFSDS) ammunition rounds which are rounds generally fired from a tank gun.

APFSDS projectiles are known and in current military use. They comprise a heavy metal penetrator or sub-projectile carrying fins at its rear end which stabilise the flight of the penetrator and a segmental sabot formed around the penetrator. The sabot permits an increased kinetic energy to be imparted to the projectile but is discarded by breaking up in flight and separating from the penetrator soon after the projectile has left the gun so that the sabot does not cause a drag on the penetrator during flight.

It is known to secure the sabot on the penetrator by simple complementary screw threads on these two components. Although the performance of known projectiles constructed in this way is satisfactory we have discovered that the performance may be improved by use of a novel construction.

According to the present invention in a first aspect a projectile for an APFSDS round comprises a penetrator rod and a sabot, the penetrator rod having at its front end a nose, at its rear end a formation for attachment of a fin tail to be carried by the penetrator rod in use and on its surface along a substantial portion of its length at least two screw thread portions between which is an unthreaded

region, the sabot being securable on the penetrator rod by screw thread portions complementary to those on the penetrator rod, the sabot having an unthreaded region between its screw thread portions, and a collar separating one of the said screw thread portions of the penetrator rod and the sabot from the other said screw thread portion of the penetrator rod and the sabot thereby providing a lock to resist movement of the penetrator screw thread portions relative to the sabot screw thread portions.

The said collar may be formed integrally on either the sabot internal surface or on the rod surface, or both, at the said unthreaded regions, although preferably it is formed as a separate item and inserted between the respective unthreaded regions. The collar may be formed of any light strong material, e.g. aluminium alloy or light steel.

The projectile is preferably assembled by mounting the sabot as separate segments on the rod with the collar between the rod and the segments and then locking the segments together with locking bands similar to those used in the prior art.

Preferably, but not essentially as described in a copending UK Patent Application by the present applicants, the screw thread of the penetrator rod is such that at the mid-diameter of the screw thread the average space between adjacent thread turns is greater than the average thickness of the thread turns.

By the "mid-diameter" (which is usually approximately equal to the "effective diameter" or "pitch line") of the thread is meant the diameter which is midway between the diameter of the penetrator rod at the crests of the thread turns and the diameter of the rod at the roots of the thread turns.

By providing a novel projectile having a screw thread locking construction as defined above the properties of the projectile are improved. The sabot interfaces between the gun and the penetrator. It transmits the propulsion

forces, which comprise a combination of axial and angular acceleration forces, from the gun to the penetrator. The construction of the projectile according to the present invention is better suited to the transmission of large axial and angular forces because it reduces the possibility of relative movement between the penetrator rod and the sabot.

It is preferred that the penetrator rod is made of any suitably dense material known for use as penetrator rods, e.g. a tungsten alloy or a dense steel alloy. It is preferred that the sabot is made of a light metal alloy, e.g. aluminium alloy, although it may be made of any suitable light high strength material known in the art.

The screw thread of the penetrator rod preferably has at the mid-diameter a thread turn spacing-to-thickness ratio of 1.5, e.g. 2 or more. For example, the pitch of the penetrator screw thread may be approximately four times the thread turn thickness at the mid-diameter. For conventional screw threads this ratio is two.

The penetrator rod screw thread in the penetrator according to the invention may be of a buttress type, i.e. having (relative to the nose of the penetrator) thread turns which are steeper in axial cross-section at their rear surface facing the fin tail than at their front surface facing the penetrator nose. For example, the thread turns of the penetrator rod may have front and rear surfaces which make angles of 45° and 7° respectively relative to the normal to the penetrator rod axis.

Preferably, in order to reduce stresses, the diameter of the penetrator rod beyond the threaded portion of the rod at its front and rear ends is no greater than the minimum diameter of the threaded portion, i.e. the diameter at the thread roots. The diameter at the front end preferably tapers to a point to provide the nose.

The penetrator rod nose may comprise a pointed tip.

The fin tail may be a known construction, e.g. made of any suitable light strong material, e.g. an aluminium alloy

which may be attached to the rear end of the penetrator rod by a screw thread joint. The tail may include a known epoxy resin coating. A charge of tracer material may be embedded in this component.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a partly cross-sectional side elevation of an APFSDS projectile; and

Figure 2 is an enlarged cross-sectional side elevation of part of the projectile shown in Figure 1.

In the drawings, a projectile comprises a penetrator rod 1 carrying a sabot 3. The sabot 3 comprises three segments or petals (the division between the segments not being shown) held together by bands 5 and 7. The sabot 3 is secured on the penetrator rod 1 by a screw thread joint 9 which is shown enlarged in Figure 2. This joint comprises a male thread 11 on the rod 1 and a female thread 13 inside the sabot 3. The male thread 11 has a buttress type profile, its thread turns making angles of 45° and 7° respectively at their front and rear surfaces to the normal to the axis of the rod 1. The male thread 11 has a 12 turns per inch form (0.305 turns per mm) and the ratio of the spacing between adjacent turns to the thickness of the turns at the mid-diameter is 2.8. The male thread 11 is in fact equivalent to a two-start thread (whose pitch is half the thread turn lead distance) having one thread omitted.

The threads 11 and 13 are separated into two portions by slots 15 and 17 respectively in which is fitted a collar 19. The collar 19 serves to lock the sabot 3 in position on the rod 1.

The rod 1 has a nose 21 and an extruded aluminium alloy fin tail 23 attached to the rod 1 by a screw thread joint 25. The fin tail 23 which has six blades incorporates a known tracer charge 27 which illuminates the flight of the penetrator during use.

The projectile is fitted in the end of a cartridge case 29 containing a charge of propellant (not shown), the cartridge case 29 being crimped into the band 7 which also serves an obturator ring. The band 7 may be made of nylon. A seal 31 is fitted on the sabot 3 behind the band 7. The seal 31 is manufactured as a separate item and, during assembly, is pressed onto the sabot 3 being located thereon by an annular slot 33 in the outer surface of the sabot 3 and a complementary annular flange 35 on the seal 31. The seal 31 is provided to prevent gases generated by burning of the propellant from entering the gap between the segments of the sabot 3 and thereby damaging the sabot 3. A foam plastics support bush 37 is provided between the rear end of the seal 31, the fin tail 23 and the cartridge case 29 providing padding which protects the rear end of the projectile in the event of accidental mechanical damage, e.g. by dropping.

The diameter of the rod 1 in its unthreaded regions is nowhere greater than the minimum diameter of the portions where the thread 11 exists. At the front end of the rod 1 a nose portion 41 is formed and an annular groove 43 is formed in the outer surface of the rear end of the nose portion 41.

The tip of the nose portion 41 is made of steel.

The rod 1 may be made of a tungsten alloy containing 95 atomic per cent tungsten as well as nickel and iron. The sabot 3 and fin tail 23 may be made of a commercial high strength aluminium alloy, e.g. the alloy having the UK designation DTD5124. The seal 31 may be made of silicone rubber and the bush 37 may be made of expanded polyurethane foam.

Claims:

1. A projectile for an APFSDS round comprising a penetrator rod and a sabot, the penetrator rod having at its front end a nose, at its rear end a formation for attachment of a fin tail to be carried by the penetrator rod in use and on its surface along a substantial portion of its length at least two screw thread portions between which is an unthreaded region, the sabot being securable on the penetrator rod by screw thread portions complementary to those on the penetrator rod, the sabot having an unthreaded region between its screw thread portions, and a collar separating one of the said screw thread portions of the penetrator rod and the sabot from the other said screw thread portion of the penetrator rod and the sabot thereby providing a lock to resist movement of the penetrator screw thread portions relative to the sabot screw thread portions.
2. A projectile as claimed in claim 1 and wherein the said collar is formed as a separate item and inserted between the said unthreaded regions.
3. A method of assembling a projectile as claimed in claim 2 and which comprises mounting the sabot as separate segments on the penetrator rod with the collar between the penetrator rod and the segments and locking the segments together with locking bands.

Amendments to the claims
have been filed as follows

1. A projectile for an APFSDS round comprising a penetrator rod and a sabot, the penetrator rod having at its front end a nose, at its rear end a formation for attachment of a fin tail to be carried by the penetrator rod in use and on its surface along a substantial portion of its length at least two screw super-calibre thread portions separated by an unthreaded region, the sabot being securable on the penetrator rod by screw thread portions complementary to those on the penetrator rod, the sabot having an unthreaded region between its screw thread portions, and a collar engaged within the said unthreaded regions of both the penetrator rod and the sabot so as to form a mechanical interconnection between the penetrator rod and the sabot thereby providing a lock to resist movement of the penetrator screw thread portions relative to the sabot screw thread portions.
2. A projectile as claimed in claim 1 and wherein the collar is formed integrally with the penetrator rod or the sabot.
3. A projectile as claimed in claim 1 and wherein the collar is formed as a separate item.
3. A method of assembling a projectile as claimed in claim 2 or claim 3 and which comprises mounting the sabot as separate segments on the penetrator rod with the collar between the penetrator rod and the segments and locking the segments together with locking bands.

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